

Spacebased Observation of Surface Momentum, Thermal, and Hydrologic Forcing and
Their Contribution to the Understanding Oceanic Seasonal to Interannual Variabilities

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The ocean and the atmosphere are coupled by the fluxes of momentum, heat, and water, but in situ measurements of these fluxes are sparse and uneven. Spaceborne sensors provide repeated global observations of some parameters from which these fluxes can be derived. The flux of momentum and kinetic energy are resulted from wind shear which can be estimated from spacebased scatterometer. The major components of heat fluxes are shortwave radiation from the sun and latent heat flux carried by evaporation. Shortwave radiation has been estimated from cloud data compiled by the International Satellite Cloud Climatology Project, and evaporation has been estimated from spacebase microwave and infrared radiometers. The water flux is the difference between precipitation and evaporation. Attempts have been made to estimate precipitation from spaceborne sensors at visible, infrared and microwave wavelengths. The status and shortfalls of the spacebased estimation of these fluxes will be summarized and assessed in this study.

Climate signals, such as El Nino, have profound environmental and economic impacts. Recently, sufficient spacebased data on both the forcing and the surface signatures of the oceanic response (sea surface temperature and sea level) have been accumulated to study oceanic seasonal-to-interannual variability. The oceanic responses to surface forcing during major El Nino events have been studied through data analysis and simulation by ocean general circulation models. The results will be presented and the impact of spaceborne observations will be demonstrated